Amendments to the Specification

Please replace the paragraph beginning on page 4, line 4 with the following rewritten paragraph:

The foregoing objective has been accomplished, according to the present invention, by providing a method of characterizing the performance of an electrostatic chuck comprising positioning the electrostatic chuck within a first vacuum chamber and measuring a measured value for a performance characteristic of the electrostatic chuck. The measured value of the performance characteristic is compared with a reference value of the performance characteristic, in which the reference value is correlated with satisfactory performance of a reference electrostatic chuck when placed in a second vacuum chamber of a semiconductor processing system in a production line and operated under standard conditions of operation. The comparison indicates the performance of the electrostatic chuck. Based on the result of the comparing step, it is determining whether the performance of the electrostatic chuck is adequate to install the electrostatic chuck in the second vacuum chamber of the semiconductor processing system in the production line.

Please replace the paragraph beginning on page 11, line 15 with the following rewritten paragraph:

With reference to **Fig. 2**, the electrostatic chuck 36 includes a dielectric body 38 having a support surface 40 that receives the substrate 12. The dielectric body 38 is fabricated of a ceramic material, such as an aluminum nitride, that has a high electrical resistivity and a suitable thermal conductivity. Embedded within the dielectric body 38 are a disk-shaped inner electrode

42 and an annular outer electrode 44 that encircles the inner electrode 42. The outer electrode 44 is substantially concentric with the inner electrode 42 and each of the electrodes 42, 44 is formed of a metal such as molybdenum. The inner electrode 42 is electrically isolated from the outer electrodes 44, so that electrodes 42, 44 can serve as opposite poles of electrostatic chuck 36 in a bipolar configuration. The outputs of a variable, high-voltage power supply 46 are electrically coupled via shielded transmission lines 48, 49 to the electrodes 42, 44 to provide a DC bias potential or clamping voltage. Typically, the high-voltage power supply 46 is cabled such that the inner electrode 42 is positively biased and the outer electrode 44 is negatively biased. The oppositely-charged inner and outer electrodes 42, 44 establishes a potential difference between the substrate 12 and the electrodes 42, 44 that electrostatically secures the substrate 12 to the support surface 40 with a clamping force proportional to the characteristics of the electrostatic chuck 36 and the applied clamping voltage. The high-voltage power supply 46 is operable to supply a clamping voltage between about negative 1500 [[Volts]] <u>volts</u> and about positive 1500 [[Volts]] <u>volts</u>.

Please replace the paragraph beginning on page 20, line 16 with the following rewritten paragraph:

Before acquiring the impedance data, the vacuum processing space 18 is evacuated to a vacuum level of less than about 0.1 mTorr and the electrostatic chuck 36 is at ambient temperature. The impedance of the electrostatic chuck 36 is measured by applying an excitation signal with voltage of constant amplitude and measuring the magnitude and phase of the resultant current while varying the frequency in discreet increments over a predetermined frequency range, such as a frequency range between about 400 kHz and about 60 MHz. The

magnitude or phase angle of the impedance data is compared with the expected frequency-dependent behavior of the impedance of a known electrostatic chuck, substantially similar to chuck 36, [[]] or a series of known electrostatic chucks, each substantially similar to chuck 36. Any statistically significant deviations from the expected behavior ~~indicates~~ indicate that the electrostatic chuck 36 undergoing evaluation is defective or that the chuck 36 undergoing evaluation is improperly assembled.

Please replace the paragraph beginning on page 21, line 17 with the following rewritten paragraph:

Examples of comparisons of the impedance performance of a defective electrostatic chuck and the impedance performance of another electrostatic chuck, substantially similar in construction and/or configuration to the defective chuck and having an acceptable performance, are illustrated about **Figs. 5A, 5B, 6A** and **6B**. With reference to **Fig. 5A,** the magnitude of the measured impedance in ohms is displayed along the left ordinate versus frequency along the abscissa over a frequency range of about 10 MHz to about 15 MHz for a known electrostatic chuck and a defective electrostatic chuck. The known electrostatic chuck has performance parameters which are acceptable for use in a semiconductor processing system in a production line. The defective chuck, as indicated by a curve on **Fig. 5A** labeled with reference numeral 112, generally exhibits an impedance that is larger over the entire frequency range than the impedance measured for the chuck having a known acceptable performance, labeled with reference numeral 110. The set of target impedance magnitudes of Curve 110 ~~define~~ defines a reference impedance magnitude level correlated with satisfactory performance of a reference electrostatic chuck when placed in a vacuum chamber of a semiconductor processing system in a

production line and operated under standard conditions of operation. **Fig. 5B** displays the magnitude of the measured impedance for the two electrostatic chucks of **Fig. 5A** in which substrate 12 is positioned on the support surface 40 before the impedance is measured. Similar to **Fig. 5A**, the impedance of the defective chuck, as indicated by the curve on **Fig. 5B** labeled with reference numeral 116, is generally larger over the frequency range between about 10 MHz and about 15 MHz than the impedance of the known chuck, labeled with reference numeral 114. It is apparent from the significant difference in the mathematical dependence of the magnitude of the impedance as a function of the frequency of the applied excitation signal that a defective chuck, such as the chuck associated with Curves 110 and 114, can be distinguished from a chuck having an acceptable performance, such as the chuck associated with Curves 112 and 116.

Please replace the paragraph beginning on page 27, line 9 with the following rewritten paragraph:

~~The operation and usage of the a~~ A routine for analyzing the performance of an electrostatic chuck (ESC) consistent with the present invention is now described. As discussed above, one or more performance characteristics of the electrostatic chuck are compared with the [[ ]]performance characteristics of a reference electrostatic chuck and, based on the result of the comparing step, it is determined whether the performance of the electrostatic chuck is adequate to install it in the second vacuum chamber of the semiconductor processing system in the production line.

Please replace the paragraph beginning on page 30, line 1 with the following rewritten paragraph:

Next, in response to the result of the comparison, a decision is made in block 174. If the performance is deemed to be adequate, a second performance characteristic chosen from the impedance characteristics as illustrated in block 152, the plasma current-collection voltage characteristics as illustrated in block 156, and the heating/cooling characteristics as illustrated in block 158 can be assessed. Alternatively, as illustrated in block 162, the electrostatic chuck can be installed into a vacuum chamber of a semiconductor processing system in a production line. If the performance is deemed to be inadequate, the electrostatic chuck is not installed into the vacuum [[ ]]chamber of the semiconductor processing system in the production line as illustrated in block 164. A decision is then made in block 166 which results in the chuck either being discarded, as illustrated in block 168, or having the failure identified. If the failure is not identifiable, the electrostatic chuck may <u>be</u> discarded in block 168. If the failure is identifiable and repair is appropriate, the electrostatic chuck may be replaced and/or refurbished, as illustrated in block 170, and reinstalled, as illustrated in block 171, into the vacuum chamber of the semiconductor processing system dedicated to performance analysis, and the analysis routine is reiterated.

Please replace the paragraph beginning on page 30, line 17 with the following rewritten paragraph:

If the routine is initiated by measuring the plasma current-collection voltage characteristics of the electrostatic chuck as illustrated in block 156, a substrate is placed on the support surface of the electrostatic chuck, a plasma is established in the processing chamber, and

the plasma current detected by [[an]] a Langmuir probe is measured as a function of applied collection voltage. The plasma current can be measured with or without the chuck heated, with or without an RF voltage applied to the substrate support, or combinations of these conditions. The plasma current is acquired by selecting at least one predetermined position proximate an exposed surface of the substrate, positioning an electrode of the Langmuir probe adjacent the predetermined position, applying a collection voltage to the electrode, and measuring the current flowing from the plasma to the Langmuir probe. As illustrated in block 176, the measured current is compared with a target current defining a reference current level correlated with satisfactory performance of a reference electrostatic chuck when placed in the vacuum chamber of the semiconductor processing system in the production line and operated under standard conditions of operation. The comparison provides an indication of the performance of the electrostatic chuck.

Please replace the paragraph beginning on page 32, line 17 with the following rewritten paragraph:

Next, in response to the result of the comparison, a decision is made in block 182. If the performance is deemed to be adequate, a second performance characteristic chosen from the impedance characteristics as illustrated in block 152, the current-voltage characteristics as illustrated in block 154, and the plasma current-collection voltage characteristics as illustrated in block 156 can be assessed. Alternatively, as illustrated in block 162, the electrostatic chuck can be installed into a vacuum chamber of a semiconductor processing system in a production line. If the performance is deemed to be inadequate, the electrostatic chuck is not installed into the vacuum chamber of the semiconductor processing system in the production line as illustrated in

block 164. A decision is then made in block 166 which results in the chuck either being discarded, as illustrated in block 168, or having the failure identified. If the failure is not identifiable, the electrostatic chuck may be discarded in block 168. If the failure is identifiable and repair is appropriate, the electrostatic chuck may [[being]] be replaced and/or refurbished, as illustrated in block 170, and reinstalled, as illustrated in block 171, into the vacuum chamber of the semiconductor processing system dedicated to performance analysis, and the analysis routine is reiterated.